

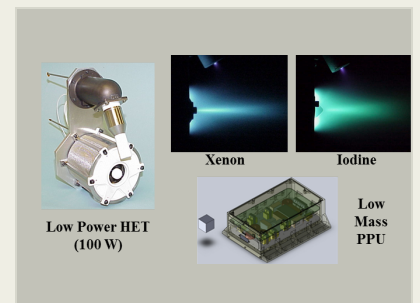
High Throughput Hall Thruster for Small Spacecraft, Phase I

Completed Technology Project (2013 - 2013)



Project Introduction

Busek Co. Inc. proposes to develop a high throughput, nominal 100 W Hall Effect Thruster (HET). This HET will be sized for small spacecraft (< 180 kg), including nano-spacecraft (<20 kg). An Edison small satellite demonstration mission could feature this thruster fueled by iodine or xenon. The Phase I program has five technical tasks. In the first task, we will determine the throttling capabilities of an improved version of our flight model 200 W thruster. The improved thruster includes permanent magnets and a modified magnetic circuit. Based upon test results, the basic dimensions of the new 100 W thruster will be determined. In the second task, the mechanical design will be created. In the third task, the magnetic circuit will be modeled using Commercial Off-The-Shelf (COTS) tools. In the fourth task, the plasma discharge will be modeled using existing simulation tools. In the final technical task, the design will be modeled thermally using COTS tools. The third, fourth, and fifth tasks will feed back into the design, which will be tailored to balance efficiency against lifetime, operating temperature, mass, volume, and other considerations. In Phase II, the high throughput low power thruster will be manufactured, tested, and improved. Performance, lifetime, and plume properties will be evaluated. Testing will include both xenon and iodine. Recent testing of a BHT-200 fueled by iodine vapor yielded stability and performance comparable to that observed with xenon, along with lower beam divergence. Iodine also offers many system level benefits including much higher stored density and much lower stored pressure than xenon. This proposal responds to topic S3.03, "Propulsion Systems." Both the "Electric Propulsion" and "Micro-Propulsion" sub-topics are relevant. The proposal also addresses several of NASA's Grand Challenges, including Efficient In-Space Transportation, Space Debris Hazard Mitigation, and Economical Space Access.



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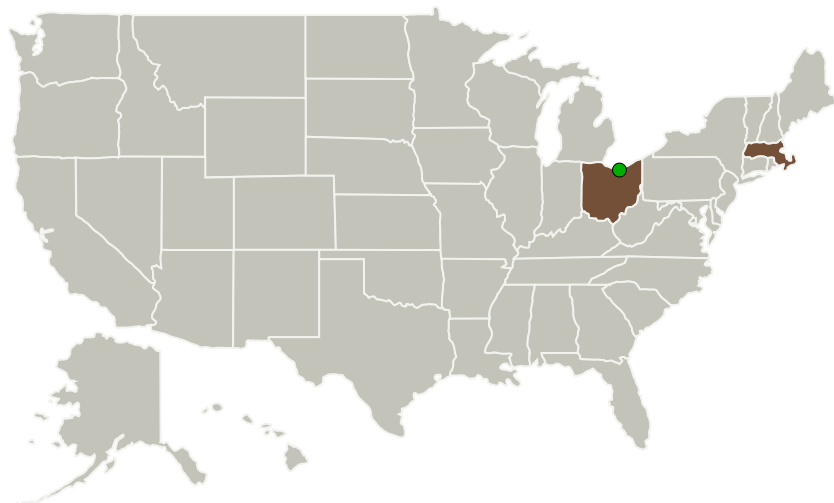
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Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|-------------------------------|-------------------------|--|-----------------------|
| Busek Company, Inc. | Lead Organization | Industry Women-Owned Small Business (WOSB) | Natick, Massachusetts |
| ● Glenn Research Center(GRC) | Supporting Organization | NASA Center | Cleveland, Ohio |

Primary U.S. Work Locations

| | |
|---------------|------|
| Massachusetts | Ohio |
|---------------|------|

Project Transitions

**May 2013:** Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Busek Company, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

James Szabo

Co-Investigator:

James Szabo

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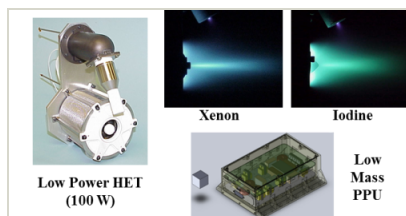


✓ **November 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140452>)

Images

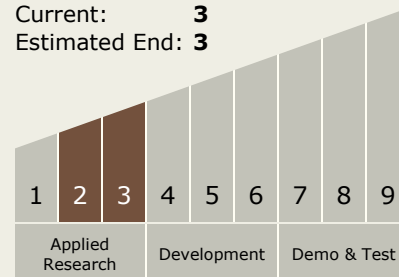


Project Image

High Throughput Hall Thruster for Small Spacecraft
(<https://techport.nasa.gov/image/126936>)

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX01 Propulsion Systems
 - TX01.2 Electric Space Propulsion
 - TX01.2.2 Electrostatic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System